

FIG. 1 PRIOR ART

SWITCHING CIRCUIT TO REDUCE SENSING
CURRENT DUTY CYCLE
(CRC CIRCUIT)

**SENSING PULSE & LOAD WAVEFORMS PRODUCED BY
ORIGINAL CRC DESCRIBED IN PATENT NUMBER 6,100,510 (DATA TAKEN ACROSS R4 +RH)**

•SENSING PULSE BEGINS AT OR NEAR ZERO CROSS AND ENDS AT OR BEFORE 60°
16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

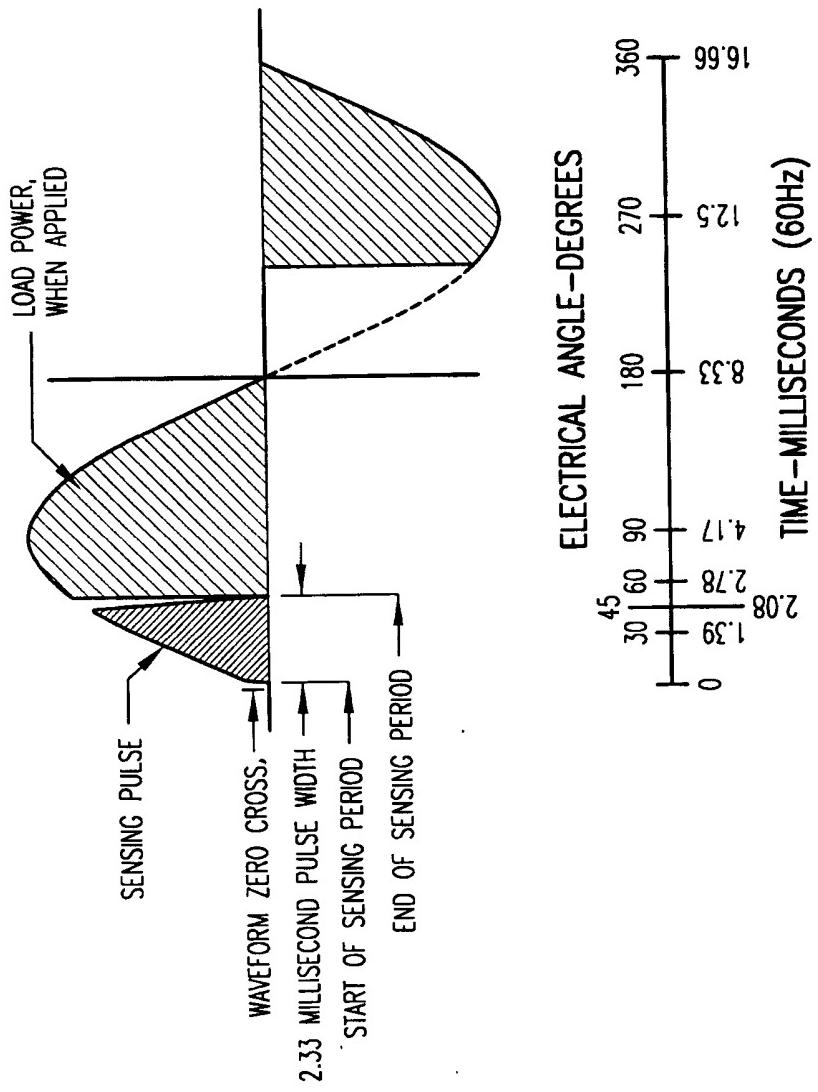


FIG. 2 PRIOR ART

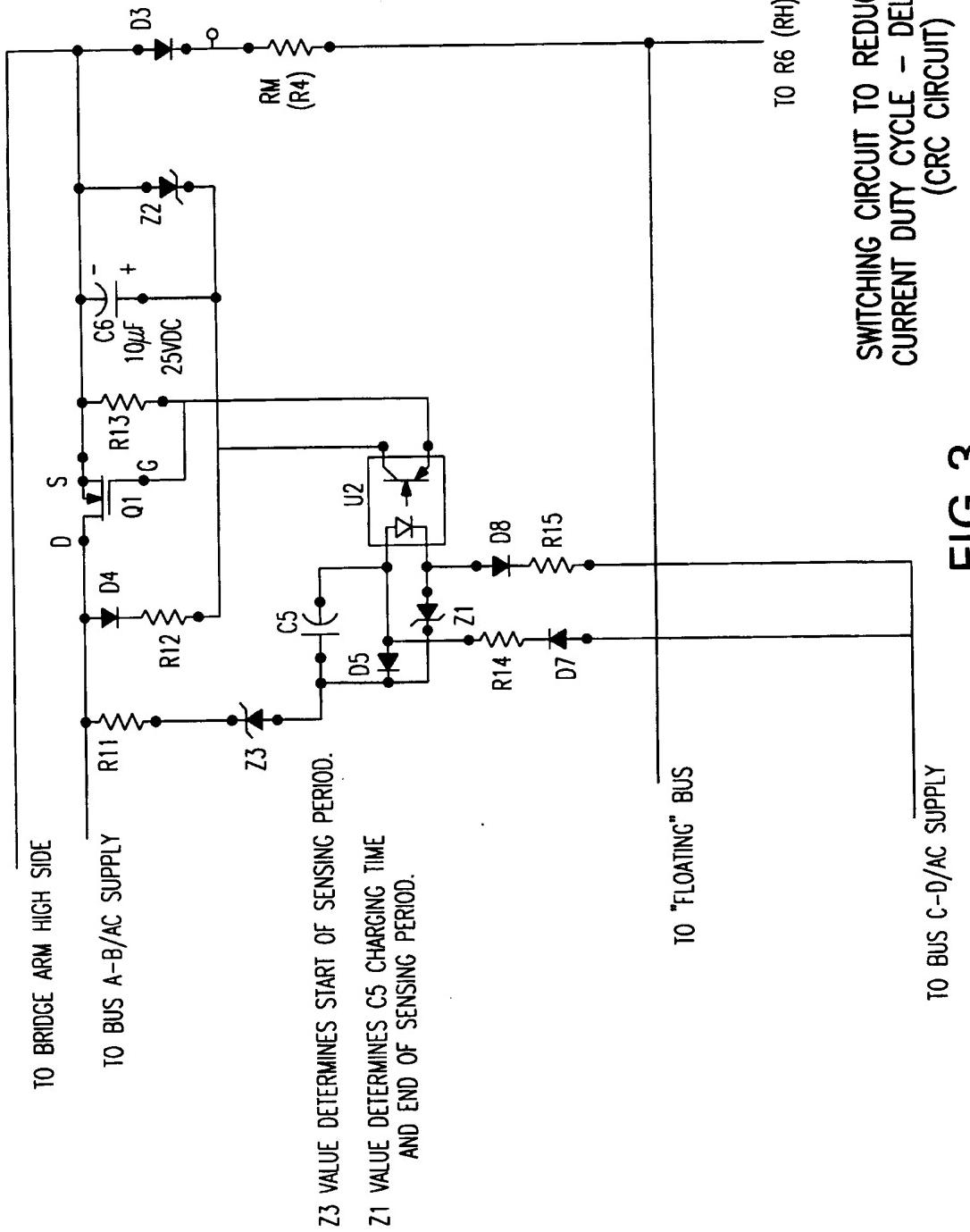


FIG. 3

DELAYED START SENSING PULSE & LOAD WAVEFORMS

- SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° 16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

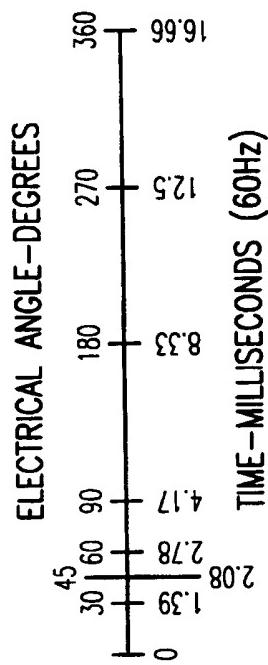
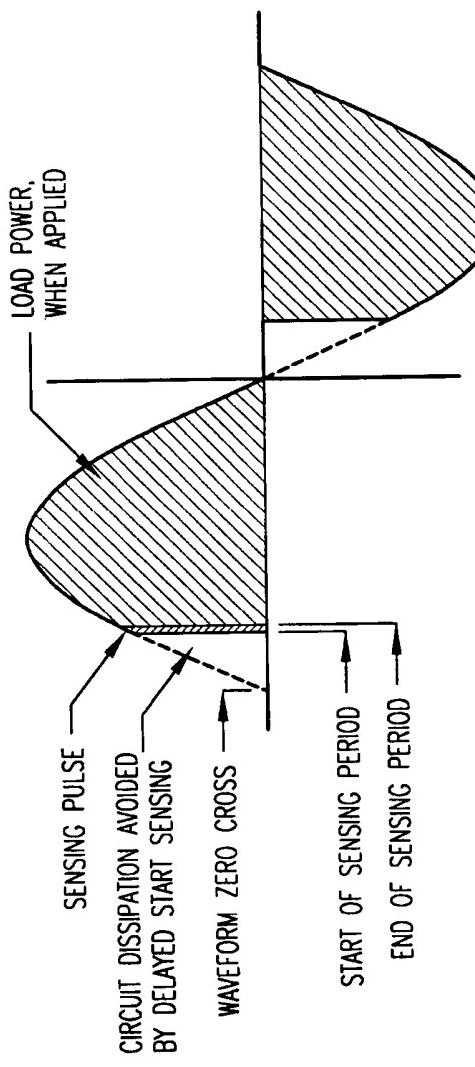


FIG. 4

$R4 = ((V_{stop}/V_{reset}) - 1) * 100$
 WHERE $V_{start} = \text{PULSE START LINE VOLTAGE}$
 $V_{stop} = \text{PULSE END LINE VOLTAGE}$
 $R4 \text{ VALUE IN Kohms}$

$R5 = (V_{stop}/(V_{pk} - V_{stop})) * ((R8 * R4) / (R8 + R4))$
 WHERE $V_{stop} = \text{PULSE END LINE VOLTAGE}$
 $V_{pk} = \text{AC LINE PEAK VOLTAGE}$
 $V_{start} = \text{PULSE START LINE VOLTAGE}$
 $R7 \text{ VALUE IN Kohms}$

$R7 = (100 * V_{start}) / (V_{pk} - V_{start})$
 WHERE $V_{pk} = \text{AC LINE PEAK VOLTAGE}$
 $V_{start} = \text{PULSE START LINE VOLTAGE}$
 $R7 \text{ VALUE IN Kohms}$

$R11 = 2350 / (V_{pk} - 5)$
 WHERE $V_{pk} = \text{AC LINE PEAK VOLTAGE}$
 $R11 \text{ VALUE IN Kohms}$

VALUES SHOWN FOR:
 $V_{pk} = 95\text{Vdc}$ (AT V_{high})
 $V_{start} = 5\text{Vdc}$
 $V_{stop} = 60\text{Vdc}$ (MUST BE LOWER THAN V_{stop})
 AT V_{low}
 $V_{reset} = 4\text{Vdc}$ (MUST BE LESS THAN V_{stop})
 $V_{low} = 44.8 \text{ Vac}$
 $V_{high} = 67.2 \text{ Vac}$

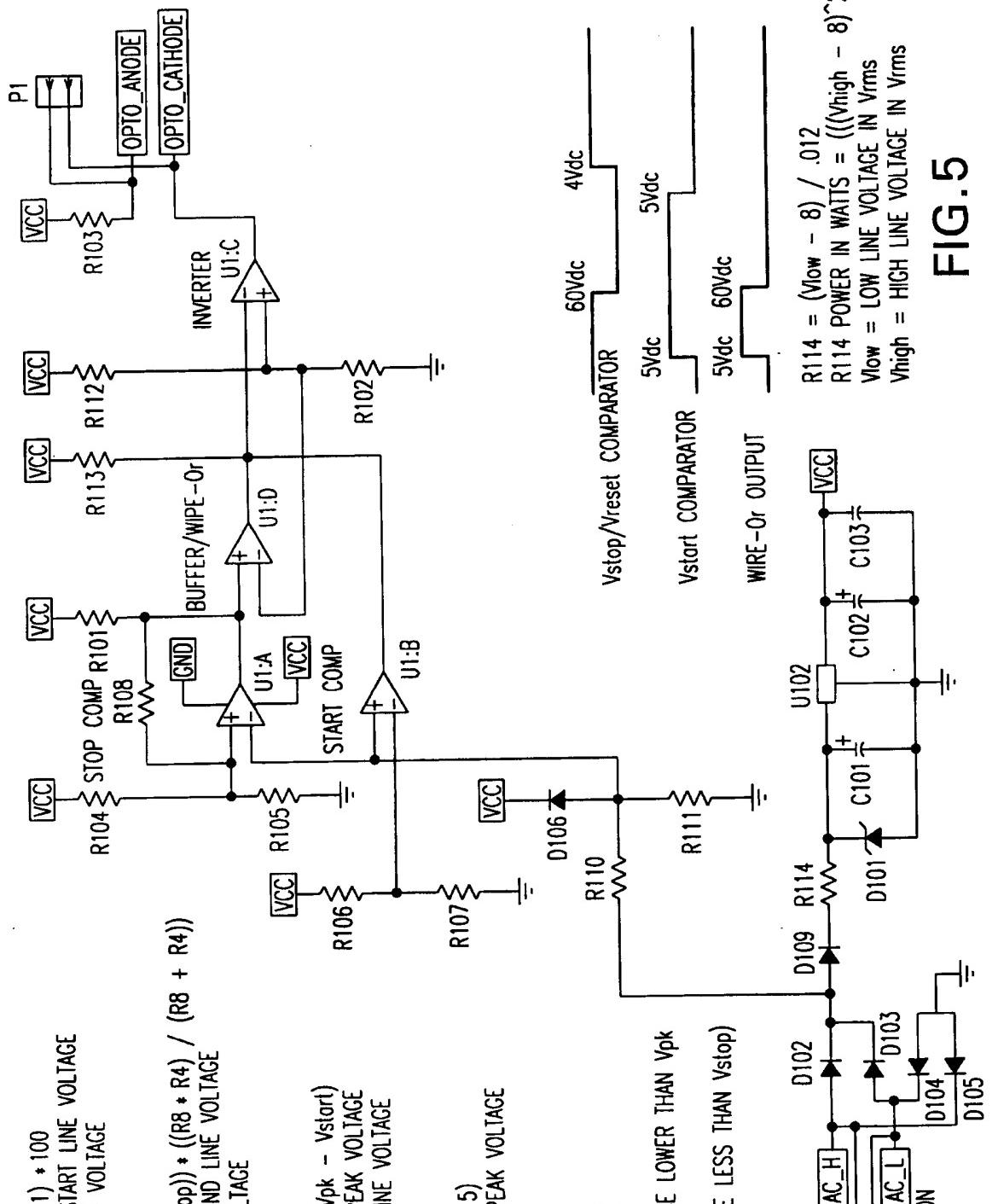


FIG. 5

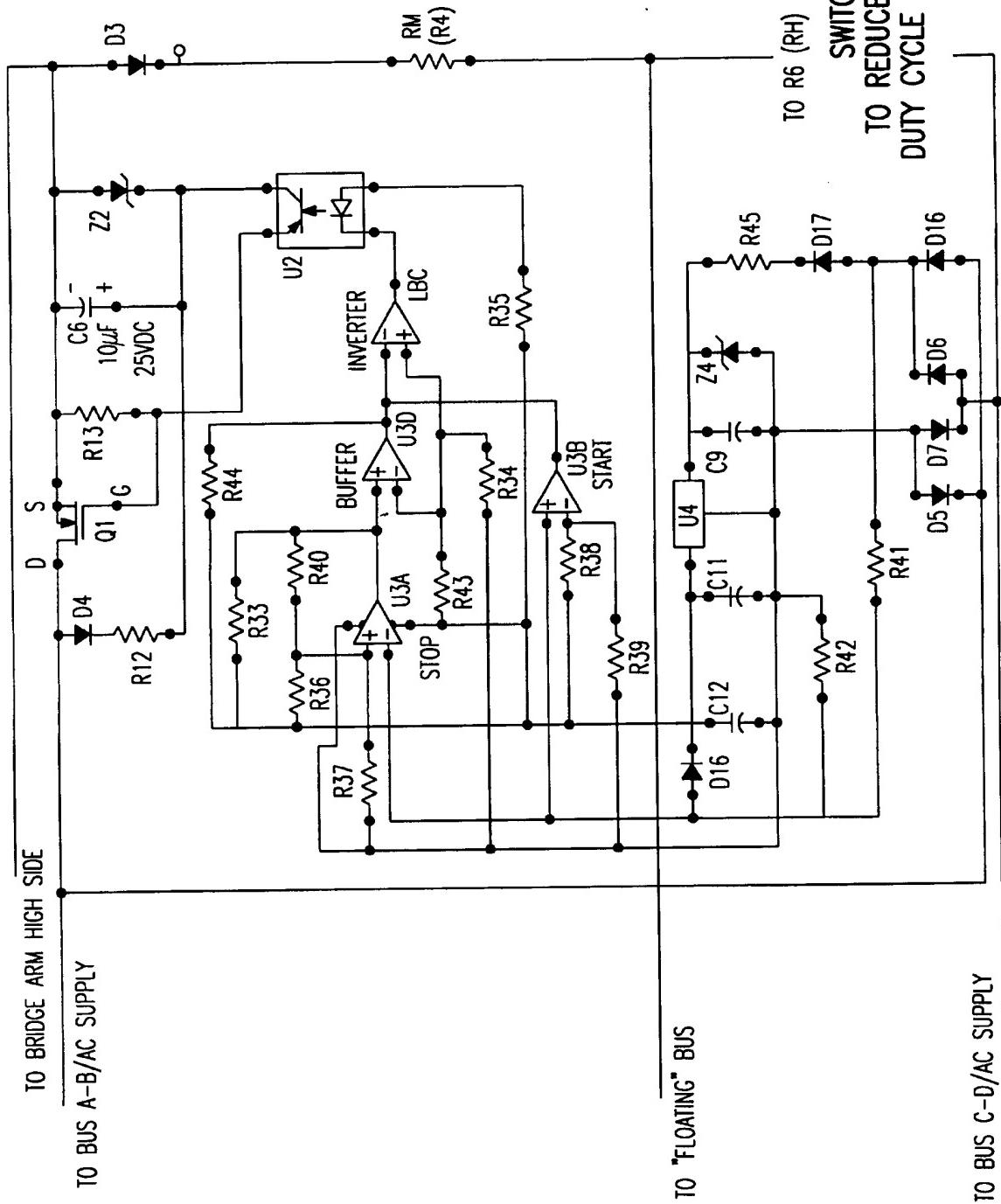


FIG. 6
CIRCUIT

DELAYED START SENSING PULSE & LOAD WAVEFORMS

- SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° WHEN OPERATING AT DESIGN VOLTAGE
8.33 millisecond SAMPLING RATE FOR 120 CYCLE PULSATING DC SUPPLY (RECTIFIED 60 Hz AC)

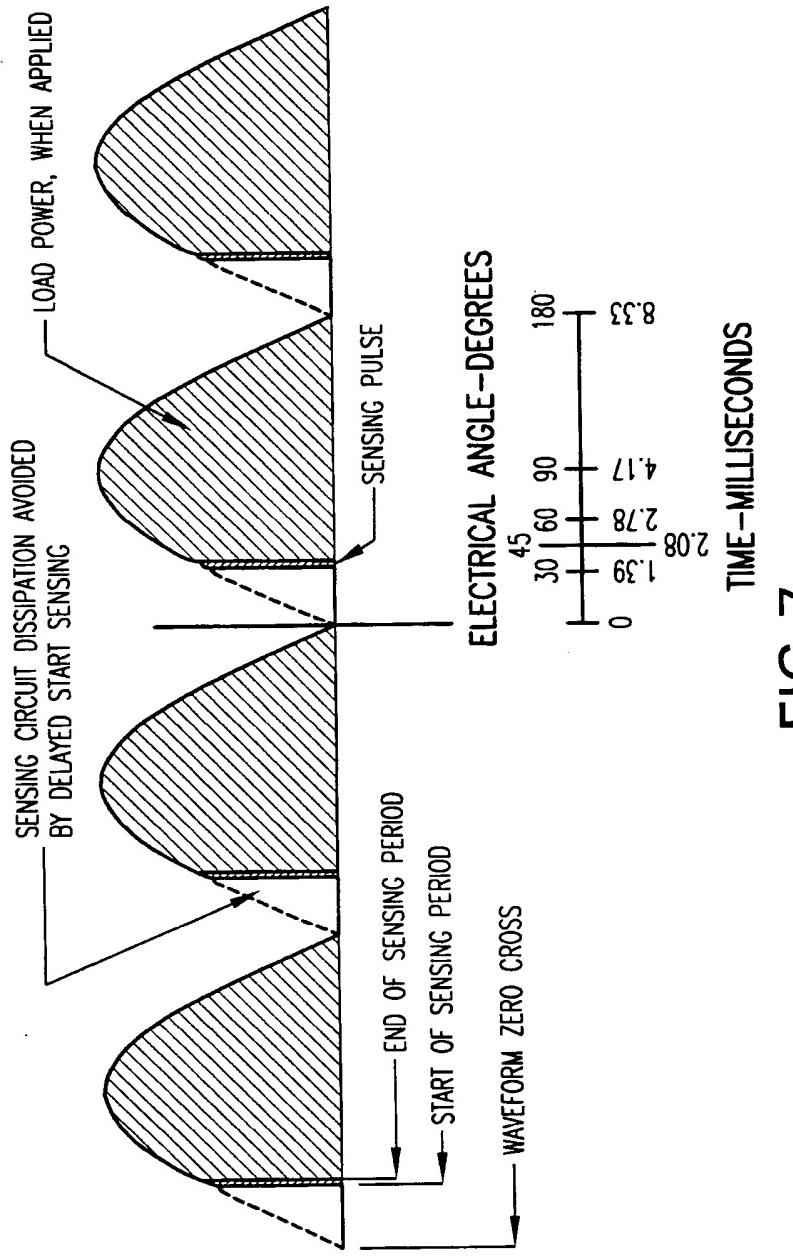


FIG. 7

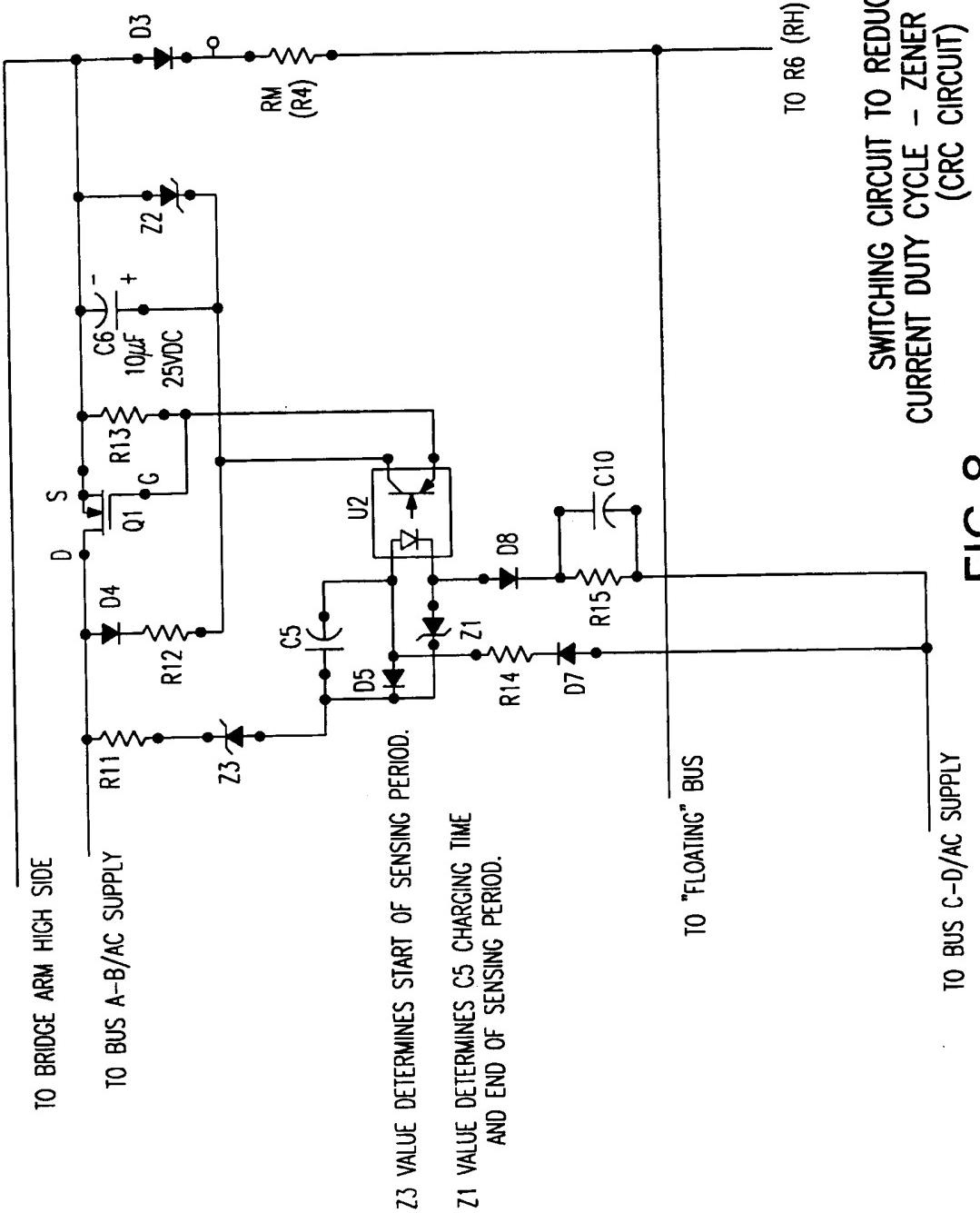


FIG. 8

SWITCHING CIRCUIT TO REDUCE SENSING CURRENT DUTY CYCLE - ZENER DELAYED START (CRC CIRCUIT)

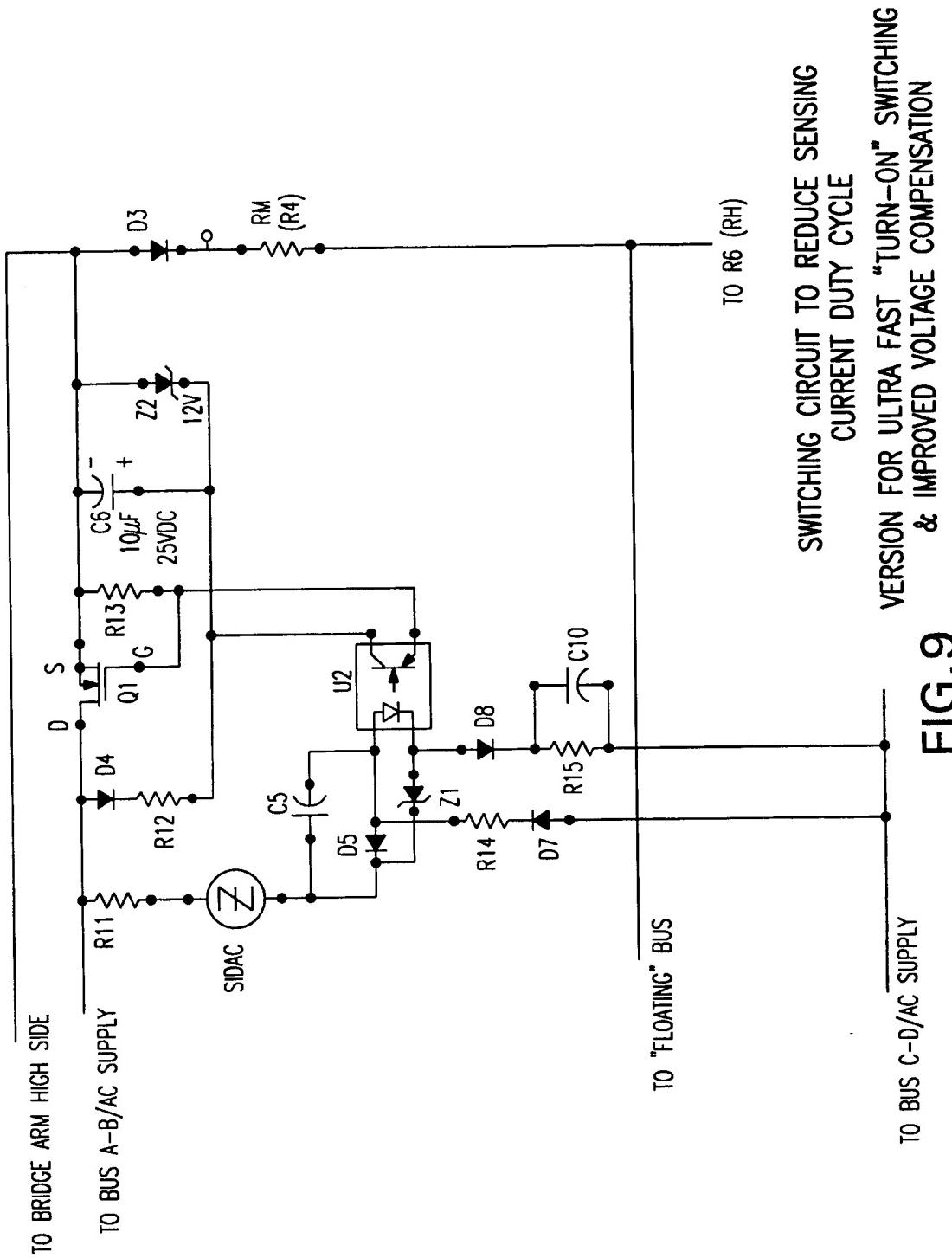


FIG. 9

**DELAYED START SENSING PULSE & LOAD WAVEFORMS
-CONTROLLED SLOPE LEADING AND TRAILING PULSE EDGE SWITCHING SHOWN**

• SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° AT DESIGN VOLTAGE
16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

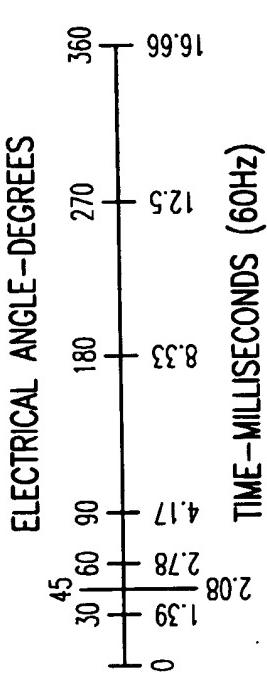
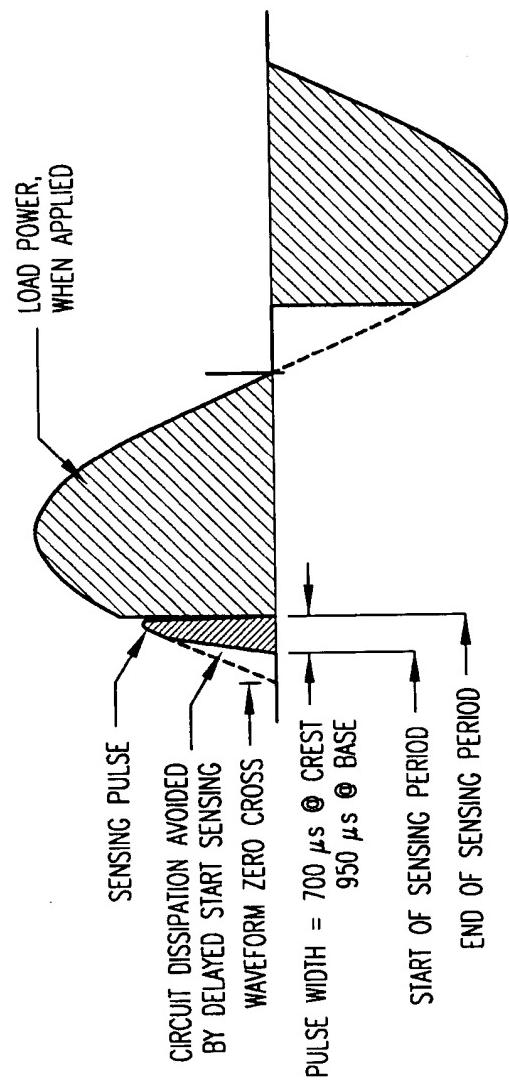


FIG. 10

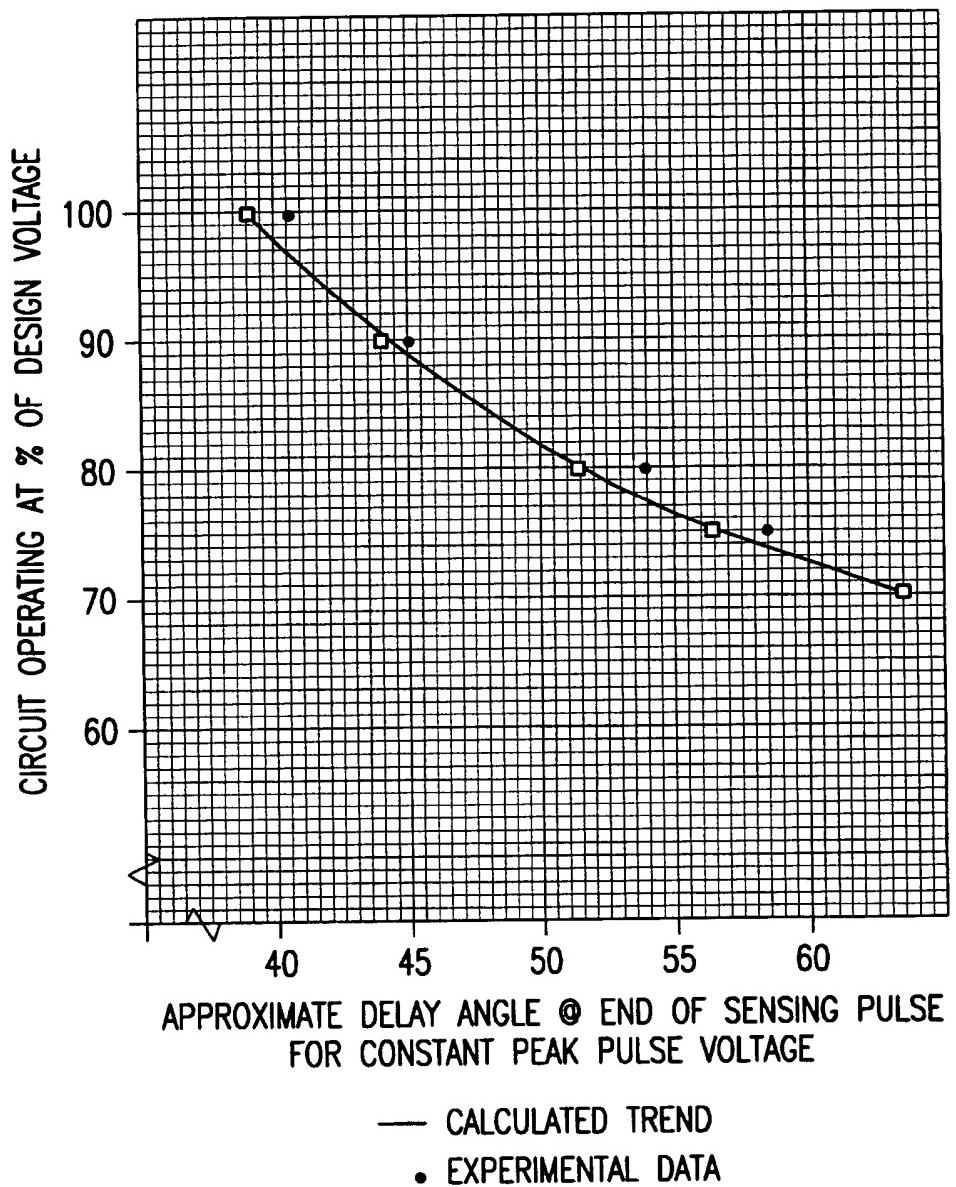


FIG.11

**DELAYED START SENSING PULSE & LOAD WAVEFORMS - 100% DESIGN VOLTAGE
NOMINAL 200 μ s PULSE WIDTH SHOWN**

• SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° WHEN OPERATING AT DESIGN VOLTAGE
16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

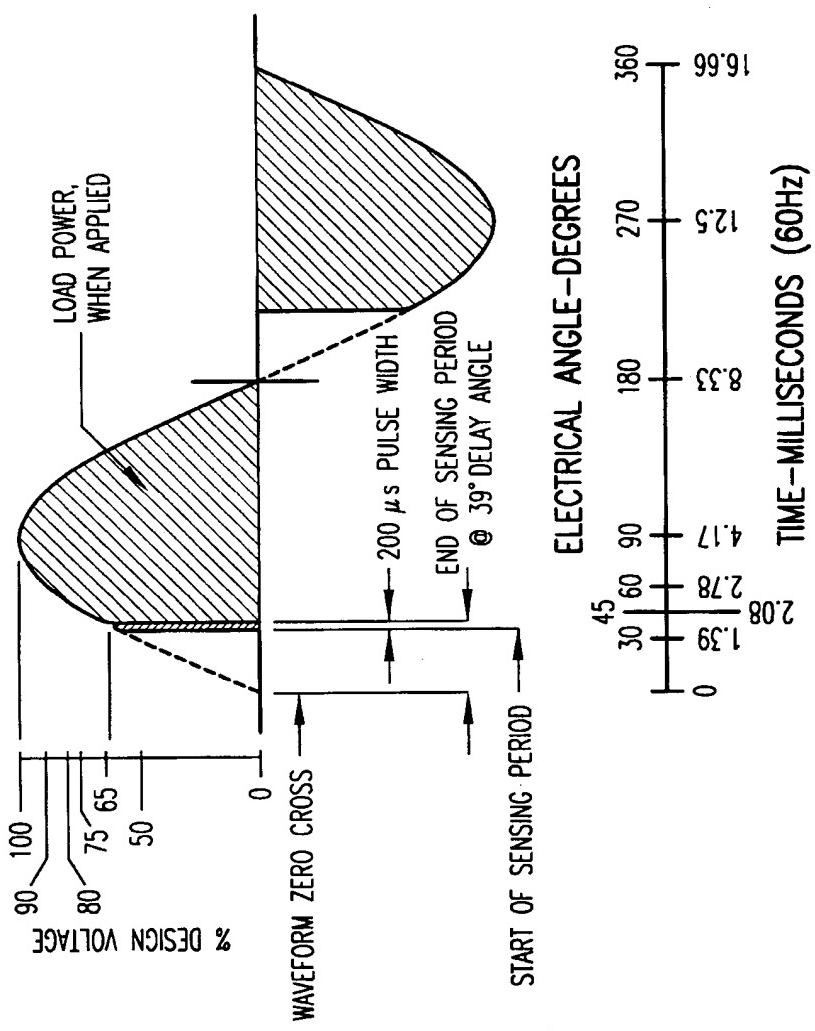


FIG. 12

**DELAYED START SENSING PULSE & LOAD WAVEFORMS -90% DESIGN VOLTAGE
-NOMINAL 200 μ s PULSE WIDTH SHOWN**

*SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° AT DESIGN VOLTAGE
16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

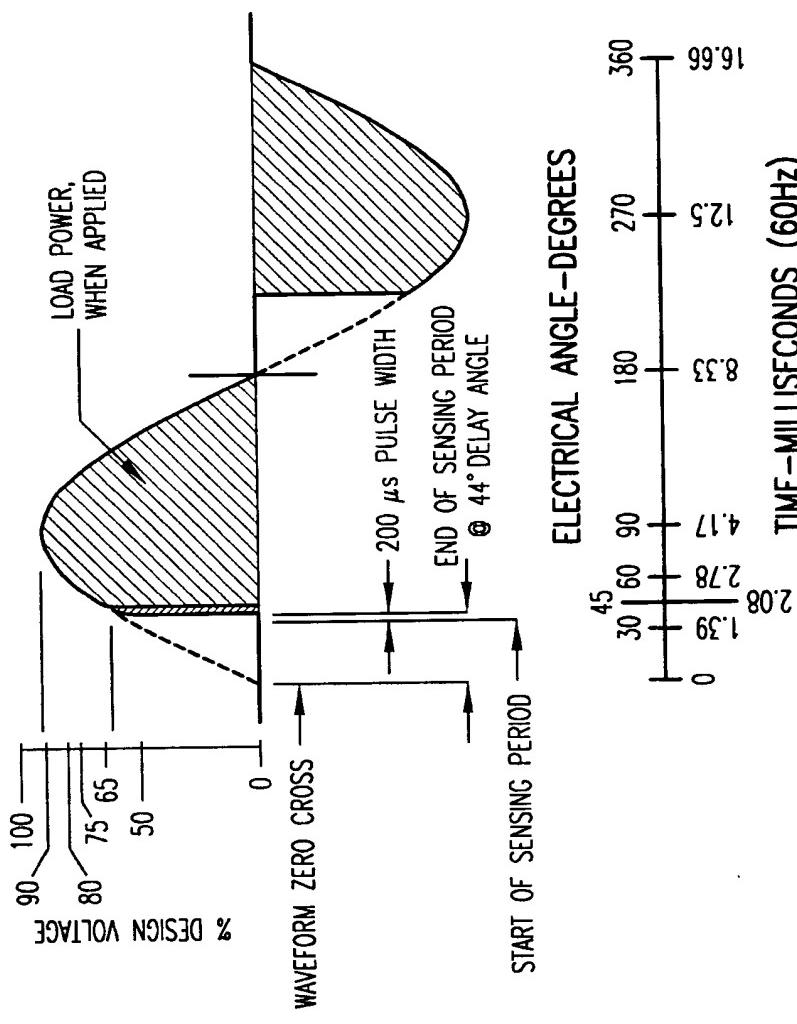


FIG. 13

**DELAYED START SENSING PULSE & LOAD WAVEFORMS -80% DESIGN VOLTAGE
-NOMINAL 200 μ s PULSE WIDTH SHOWN**

• SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° AT DESIGN VOLTAGE
16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

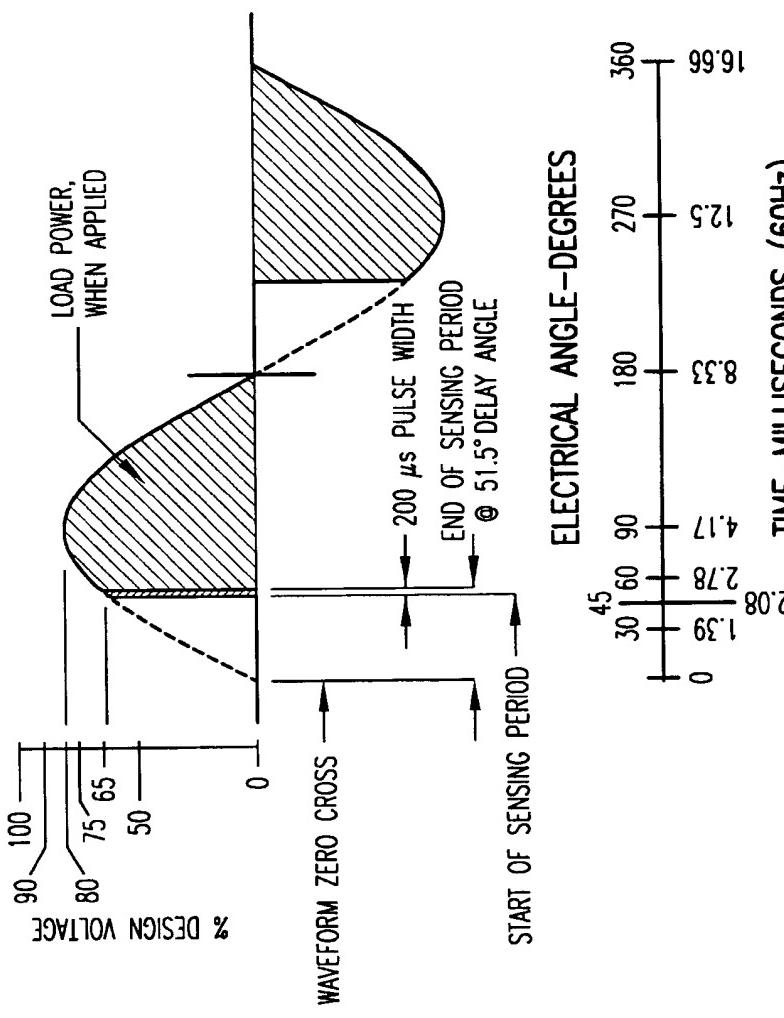


FIG. 14

**DELAYED START SENSING PULSE & LOAD WAVEFORMS - 75% DESIGN VOLTAGE
-NOMINAL 200 μ s PULSE WIDTH SHOWN**

- SENSING PULSE BEGINS BEYOND ZERO CROSS AND ENDS AT OR BEFORE 60° AT DESIGN VOLTAGE
16.6 millisecond SAMPLING RATE FOR 60 CYCLE AC SUPPLY

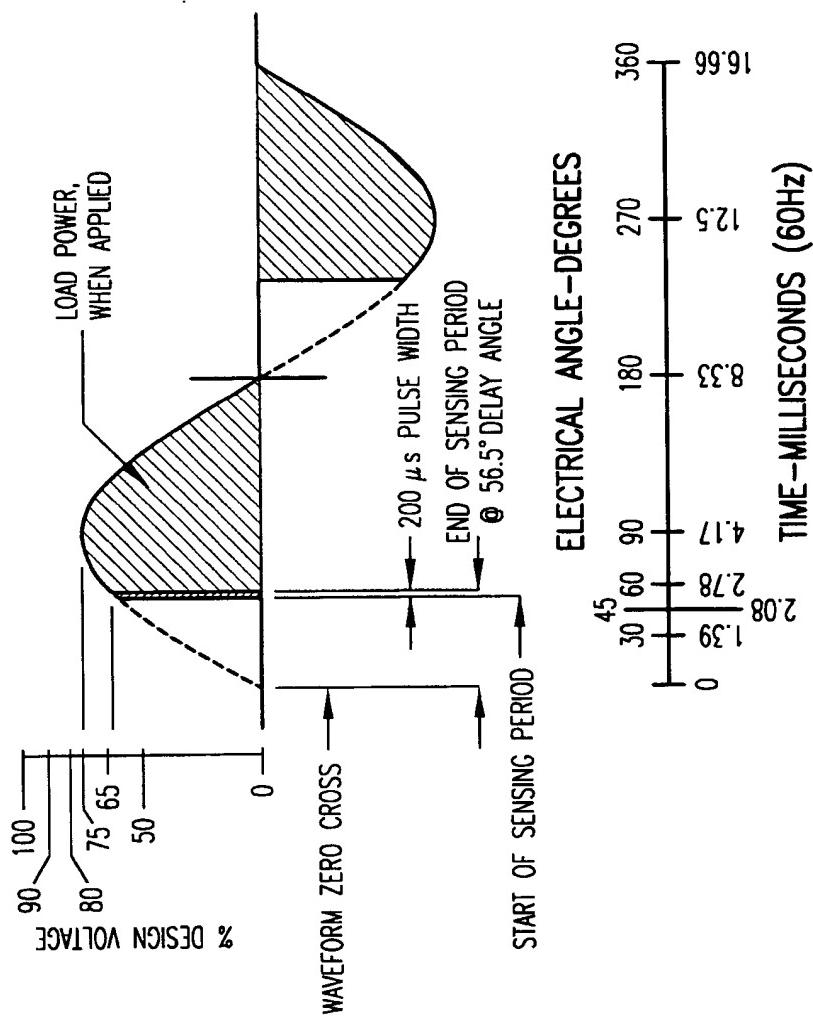


FIG. 15

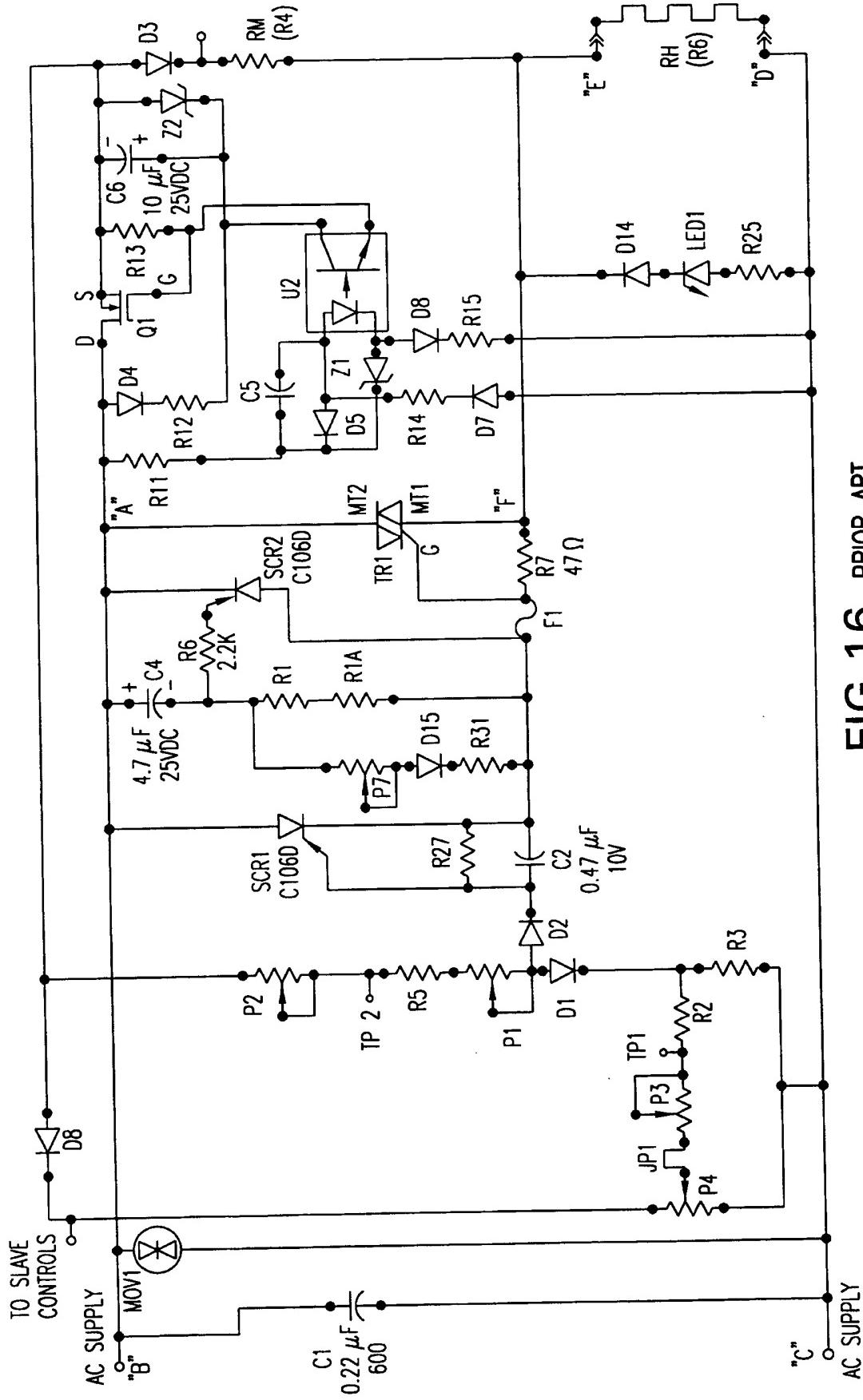


FIG. 16 PRIOR ART